

**IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA**

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|----------------------------|---|---------------------------|
| STATE OF OKLAHOMA, et al., |) | |
| |) | |
| Plaintiffs, |) | |
| |) | |
| v. |) | Case No. 05-cv-329-GKF-SH |
| |) | |
| TYSON FOODS, INC., et al., |) | |
| |) | |
| Defendants. |) | |

**THE STATE OF OKLAHOMA’S PROPOSED FINDINGS OF FACT AND
CONCLUSIONS OF LAW FROM THE DECEMBER 2024 HEARING**

TABLE OF CONTENTS

| | | |
|------------|---|-----------|
| I. | Findings of Fact | 2 |
| A. | Oklahoma water quality standards | 3 |
| B. | Question 1: Whether the waters of the IRW <i>still</i> have elevated phosphorus levels | 5 |
| 1. | Phosphorus levels in the Illinois River and its tributaries | 5 |
| 2. | Phosphorus levels in Lake Tenkiller | 7 |
| 3. | Summary of findings | 8 |
| C. | Question 2: Whether the waters of the IRW are <i>still</i> injured as a result of these elevated phosphorus levels | 8 |
| 1. | Phosphorus-related injuries as to the Illinois River and its tributaries | 8 |
| 2. | Phosphorus-related injuries as to Lake Tenkiller | 9 |
| 3. | Summary of findings | 10 |
| D. | Nonpoint source phosphorus | 10 |
| E. | Question 3: Whether phosphorus from current and historic land-application of poultry litter in the IRW for which Defendants are responsible is <i>still</i> a substantial contributor to the elevated, injury-causing phosphorus levels in the waters of the IRW | 14 |
| 1. | Phosphorus from Defendants' current poultry operations in the IRW | 14 |
| 2. | Legacy phosphorus from Defendants' historic poultry operations in the IRW | 23 |
| 3. | Summary of findings | 25 |
| II. | Conclusions of Law | 25 |

On January 18, 2023, the Court entered its Findings of Fact and Conclusions of Law, “find[ing] in favor of the State and against defendants on the State’s claims of statutory public nuisance, federal common law nuisance, trespass, for violation of 27A Okla. Stat. § 2-6-105, and for violation of 2 Okla. Stat. § 2-18.1.” [Doc. 2979 at 213]. Specifically, this Court found: (1) the waters of the IRW¹ have elevated phosphorus levels, [see, e.g., *id.* at FOF Nos. 130, 168, 239]; (2) the waters of the IRW were injured by these elevated phosphorus levels, [see, e.g., *id.* at FOF Nos. 129-30, 168-72, 239-50, 286-88]; and (3) the principal contributor of these phosphorus levels in the waters of the IRW has been and continues to be land-applied poultry litter, [see, e.g., *id.* at FOF Nos. 288, 365-71, 531-32, 535, 539-43, 561, 585-86], as well as legacy phosphorus in the soils due to the historic land application of poultry litter, [see, e.g., *id.* at FOF Nos. 81, 362, 365-70, 375, 531-32, 535, 542-43; COL Nos. 49, 61].

Following the parties’ unsuccessful efforts at mediation regarding remedies, [see Doc. 2979 at 213; Docs. 3008 & 3009], Defendants moved to dismiss the State’s claims, arguing, *inter alia*, that the State’s claims were constitutionally and prudentially moot. [Doc. 3010]. On June 26, 2024, the Court denied Defendants’ motion. [Doc. 3023]. In ruling that the State’s claims were not constitutionally moot, the Court found that “defendants offer no evidence of a change in their practices with respect to poultry waste” or of a “complete absence [] of continuing injury from either past or present application of poultry waste.” [*Id.* at 7]. With respect to prudential mootness based on a purportedly stale record, the Court ruled it “need not decide the issue, . . . as, based on new evidence, the court shall make additional findings and conclusions as to the specific terms of

¹ The “waters of the IRW” means the Illinois River and its tributaries designated as “Scenic Rivers” subject to the 0.037 mg/L total phosphorus standard, [see 82 Okla. Stat. § 896.5 (designating the Illinois River, Flint Creek, and the Barren Fork as Scenic Rivers); Okla. Admin. Code (“OAC”) § 252:730-5-19(c)(3) (stating numeric criterion for Scenic Rivers)], as well as Lake Tenkiller.

the injunctive relief and the act or acts to be restrained or required.” [*Id.* at 8]. Accordingly, on September 13, 2024, the Court held a status conference at which it explained that “prior to the entry of judgment, the court retains inherent power to make amended findings and additional conclusions” and thus ruled that, “based on new evidence, the court shall make additional findings and conclusions as to the specific terms of the injunctive relief in the act or acts to be restrained.” [Doc. 3040 (Tr. of 9/13/2024 Status Conf. at 5:8-13)]. The Court set an evidentiary hearing for December 2024 to afford the parties the opportunity to present new evidence. [*Id.* at 5:14-22; *see also id.* at 5:23-6:1]. The Court subsequently clarified that the hearing would not address remedies, but instead focus on whether “the conditions in the IRW [have] materially changed following the end of trial.” [Doc. 3098 (Tr. of 11/26/24 Status Conf. at 4:4-25)].

The hearing took place over six days. The State presented seven witnesses, and Defendants presented six witnesses. In all, 92 exhibits were entered in evidence. [Docs. 3137 & 3139]. A robust record was thus developed over the course of the hearing. On January 30, 2025, the two sides made their post-hearing submissions. Having carefully heard and reviewed the evidentiary record, as well as the parties’ submissions, the Court finds and concludes as follows:

I. Findings of Fact

1. In order to determine the specific terms, if any, of the remedial relief to be ordered, the Court must first determine the following three baseline questions:
 - a. Whether the waters of the IRW *still* have elevated phosphorus levels;
 - b. Whether the waters of the IRW are *still* injured as a result of these elevated phosphorus levels; and
 - c. Whether phosphorus from current and historic land-application of poultry litter in the IRW for which Defendants are responsible is *still* a substantial contributor to these elevated, injury-causing phosphorus levels in the waters of the IRW.

A. Oklahoma water quality standards

2. This Court previously made extensive findings regarding Oklahoma's water quality standards.² [Doc. 2979 at FOF Nos. 25-43 (detailing applicable narrative and numerical standards, antidegradation standards, and designated beneficial uses for the waters of the IRW)]. These findings, which provide a measuring stick for water quality, need not be restated here. One point, however, does warrant discussion as there was dispute at the hearing as to what data should be considered in evaluating violations of Oklahoma's water quality standards. Specifically, Defendants contended that only low-flow or base-flow³ samples should be considered in evaluating whether the 0.037 mg/L aesthetics criterion for total phosphorus concentration for Scenic Rivers in the IRW, [see OAC § 252:730-5-19(c)(3)], has been violated. [Doc. 3091 at 21]. In support of this contention, Defendants advanced two arguments. First, Defendants pointed to a recent amendment to the protocols for assessment of aesthetics support. [See OAC § 785:46-15-14]. Second, Defendants pointed to the 2016 Final Report to Governors from the Joint Study Committee and Scientific Professionals (the "2016 Joint Study"). [See OKLA_PX_0233]. For the reasons that follow, neither argument withstands scrutiny.

3. Oklahoma regulations regarding the protocols for assessment of aesthetics resolve this issue. As amended, Oklahoma Administrative Code § 785:46-15-14(c) provides for use of a rolling 6-month arithmetic mean in determining whether the aesthetics beneficial use designated in Oklahoma Administrative Code § 252:730 is supported with respect to the total phosphorus

² The state's water quality standards for the IRW have been approved by the Environmental Protection Agency ("EPA"), and as such have become federal law. [Doc. 2979 at FOF No. 34].

³ Low flow or base flow is when the river's dominant influence is groundwater between rainy periods. [TR at 308:18-22 (L. Phillips); TR at 79:12-16 (Fite) (testifying that low flow and base flow are the same thing)]. High flow is any time the river is above base flow. [TR at 309:2-7 (L. Phillips)]. Ambient flow is the flow during a routine monitoring event which can include any type of flow, including high flows. [TR at 308:23-310:13 (L. Phillips)].

criterion for the Illinois River, Flint Creek, and Barren Fork Creek,⁴ which by its plain language includes *all* flow regimes in the analysis. [See OAC § 785:46-15-14(c)(2)(B) (requiring “[a]ll available individual data values from any given month must be included in the rolling 6-month arithmetic mean calculation”) (emphasis added); *see also* OAC § 785:46-15-3(a) (requiring “[a]ll existing data available for a waterbody shall be used in the [beneficial use] analysis . . .”) (emphasis added)]. The State’s non-retained expert Lance Phillips⁵ confirmed not only that OWRB’s sampling protocols by regulation still include all flow regimes, including high flows, [TR at 308:8-310:12 (L. Phillips)], but also that the 0.037 mg/L aesthetics criterion applies to all flows, including high flows. [TR at 310:20-25, 316:18-21 (L. Phillips); *see also* TR at 213:1-4, 241:24-242:5 (Chambers) (0.037 mg/L standard applies to all flow regimes and all available sampling data is used)]. Indeed, Defendants’ retained expert, Dr. John Connolly,⁶ agreed there is nothing in Oklahoma Administrative Code § 785:46-15-14(c) that excludes use of high-flow samples in calculating the 6-month rolling arithmetic mean. [TR at 892:11-23 (Connolly)].⁷

4. The 2016 Joint Study does not point to a different conclusion. The purpose of the

⁴ Previously, a 3-calendar-month geometric mean was used in determining whether the aesthetics beneficial use now housed in Oklahoma Administrative Code § 252:730 was being supported with respect to the total phosphorus criterion. [See OAC § 785:46-15-14(c) enacted effective July 1, 2008, 25 Okla. Reg. 1455 (stating “A three-calendar-month geometric mean concentration shall be determined each month using the total phosphorus data from that month together with such data from the preceding two calendar months”)]. OAC § 785:46-15-14(c) was amended to its current form effective Sept. 11, 2021, [see 38 Okla. Reg. 2762], and now provides for the use of a 6-month arithmetic mean in determining whether the aesthetics beneficial use is supported.

⁵ Mr. Phillips is the Environmental Programs Manager for the Streams and Rivers Monitoring Section at the Oklahoma Water Resources Board (“OWRB”). [TR at 305:18-315:6 (L. Phillips); OKLA_PX_333].

⁶ Dr. Connolly is a Senior Technical Advisor at Anchor QEA, an environmental science and engineering consulting firm. [TR at 759:14-18 (Connolly); DJX2-0217-A]. Dr. Connolly testified for Tyson Foods in the 2009 trial. [TR at 762:16-24 (Connolly)].

⁷ To use only low flow or base flow sample results in the analysis would not give a full and accurate picture of the water quality in the Illinois River and its tributaries. [TR at 80:13-23 (Fite)].

2016 Joint Study was to determine *the concentration level* at which phosphorus caused a biological response in the river.⁸ [OKLA_PX_0233_00002-03; *see also* Doc. 2979 at FOF No. 50 fn. 4 (discussing Second Statement of Joint Principles and Actions)]. Its purpose was not to determine *the flow rate* at which phosphorus caused a biological response in the river. In fact, the 2016 Joint Study notes that “[w]ater and biological samples were collected over a variety of flows across the study.” [OKLA_PX_0233_00004]. Defendants, however, point to a line in the Joint Study stating that “[t]he Joint Study Committee unanimously defined the ‘critical conditions’ for the Joint Study as the conditions where surface runoff is not the dominant influence of total flow and stream ecosystem processes.” [*Id.*]. Importantly, Oklahoma has not adopted the concepts of “dominant influence” and “critical condition” into its water quality standards. [TR at 362:12-15 (L. Phillips)].⁹

5. The Court thus finds that the 0.037 mg/L aesthetics criterion contained in the Oklahoma water quality standards applies at all flows in the Scenic Rivers of the IRW, including high flows. The Court also finds that phosphorus causes a biological response (*i.e.*, injury) in the Scenic Rivers of the IRW at a concentration level of 0.037 mg/L.

B. Question 1: Whether the waters of the IRW *still* have elevated phosphorus levels

1. Phosphorus levels in the Illinois River and its tributaries

6. Mr. Phillips of the OWRB provided expert testimony that phosphorus concentrations in the Illinois Rivers and its tributaries continue to be elevated beyond natural or

⁸ The 2016 Joint Study concluded that biological responses (*i.e.*, formation of nuisance algae) occurred at 0.035 mg/L. [TR at 775:9-23 (Connolly); TR at 349:24-350:15 (L. Phillips); TR at 125:21-25 (Fite); OKLA_PX_0233_00007]. A 0.035 mg/L standard was not incorporated into Oklahoma’s water quality standards, however, due to “the agreement that if it fell within a certain range, that they would just keep the 0.037.” [TR at 316:4-17, 354:10-18 (L. Phillips)].

⁹ Notably, the data in the Joint Study showed a biological response in the river following storm events (*i.e.*, high flow events). [See OKLA_PX_0233_00036-037 & _00041; *see also* TR at 867:5-868:15 (Connolly)].

background levels and exceed the total phosphorus criterion applicable to Scenic Rivers. [TR at 316:22-318:16 (L. Phillips)]. Mr. Phillips based this opinion upon OWRB data and United States Geological Survey (“USGS”) data. [TR at 315:20-25, 316:22-317:25 (L. Phillips)].

7. The State’s non-retained expert, Ms. Julie Chambers, also of the OWRB,¹⁰ provided expert testimony that, based on her analysis of OWRB and USGS water quality data that was used in putting together the 2024 Arkansas-Oklahoma Arkansas River Compact Environmental Report (“Compact Commission Report”)¹¹ and the 2022 Integrated Report, trends in phosphorus loadings in the Illinois River and its tributaries show there has been an upward tick in the most recent 5-year rolling average time window. [TR at 213:5-214:16 (Chambers); OKLA_PX_0258; OKLA_PX_0248]. Further, when targeted high-flow water sampling from the USGS is included with the ambient sampling data collected in the Oklahoma portion of the IRW, the data show that since the 2009 trial average annual phosphorus concentrations at all of the Compact Commission sampling stations in the Oklahoma portion of the IRW have regularly

¹⁰ Ms. Chambers is the Environmental Programs Manager for the Lake and Wetlands Section at the OWRB. She oversees the data analysis for the State’s Integrated Reports. [TR at 189:2-192:5 (Chambers); OKLA_PX_0332].

¹¹ The Compact Commission Report is an annual report submitted to the Compact Commission that is designed to show total phosphorus loading, as well as a five-year rolling average of concentrations and loading, in the Illinois River and its tributaries based on data from the OWRB and USGS. [TR at 197:4-22, 210:9-211:2 (Chambers)]. Use of a five-year rolling average is dictated by the Compact Commission. [TR at 281:22-282:1 (Chambers)]. The data from the Compact Commission Report is used to evaluate whether the Compact Commission’s goal for a 40 percent reduction in phosphorus loading has been achieved. [TR at 212:17-19 (Chambers)]. The 40 percent reduction goal, which is tied to a 1980-93 baseline level of phosphorus, is not an Oklahoma water quality standard. [TR at 212:20-22, 232:12-233:7 (Chambers)]. Notably, the Compact Commission Report does not include USGS targeted high-flow data in its analysis, as collection of this data did not start until 1999 and would thus not be part of the full record. [TR at 211:18-212:9, 233:8-21 (Chambers)]. Further, the Compact Commission Report is not designed to determine whether a water body is impaired. [TR at 272:21-23 (Chambers)].

exceeded the 0.037 mg/L standard. [OKLA_PX_0231; TR at 220:20-225:4 (Chambers); *see also* TR at 28:11-29:6 (Fite)].

8. The State's non-retained expert, Ms. Shanon Phillips of the Oklahoma Conservation Commission ("OCC"),¹² similarly testified that since the 2009 trial total phosphorus concentrations in the waters of the IRW have not declined. [TR at 418:4-16 (S. Phillips)].

9. In response to the State's evidence, Defendants showed data reflecting that since 1993 phosphorus loadings and concentrations in the Illinois River and its tributaries have been trending downward. [*See, e.g.*, TR at 246:24-248:15, 256:12-18 (Chambers)]. However, this downward trend is only apparent when the trend analysis begins with a 1990s baseline, and does not occur when the trend analysis begins following the 2009 trial. [OKLA_PX_0252_00119; OKLA_PX_0253_00130; OKLA_PX_0255_00051; OKLA_PX_0258_0005; TR at 265:10-270:2 (Chambers)]. For instance, when the trend analysis is started post-2009, the data show increasing or, at best, level trends in phosphorus loadings and concentrations in the Illinois River and its tributaries.¹³ [TR at 268:10-13 (Chambers); TR at 359:3-22 (L. Phillips); OKLA_PX_0231]. Thus, Defendants' assertion that phosphorus loadings and concentrations in the Illinois River and its tributaries have "significantly improved since trial," [*see* Doc. 3091 at 20], is not supported by the evidence.

2. Phosphorus levels in Lake Tenkiller

¹² Ms. Phillips is the Water Quality Director at the OCC. [TR at 367:17-25 (S. Phillips); OKLA_PX_0336]. Ms. Phillips testified in the 2009 trial. [TR at 368:1-2 (S. Phillips)].

¹³ Defendants note that 2019 was an unusually wet year, and attribute that fact to skewing the five-year rolling average trend upward. But Defendants ignore that unusually dry years similarly can skew the trend downward. [TR at 312:21-313:2 (L. Phillips); TR at 284:15-21 (Chambers)].

10. Ms. Chambers testified that phosphorus concentrations in Lake Tenkiller continue to be elevated beyond natural or background levels, and that the lake's high nutrient concentrations continue to cause it to be categorized as eutrophic.¹⁴ [TR at 202:7-203:13 (Chambers)].

3. Summary of findings

11. The Court finds that the Illinois River and its tributaries in Oklahoma, as well as Lake Tenkiller, still have elevated phosphorus levels.

C. Question 2: Whether the waters of the IRW are *still* injured as a result of these elevated phosphorus levels

1. Phosphorus-related injuries as to the Illinois River and its tributaries

12. Mr. Phillips provided expert testimony regarding some of this Court's core findings from the 2009 trial regarding injuries to the Illinois River and its tributaries due to elevated phosphorus levels (*e.g.*, Doc. 2979 at FOF Nos. 128, 130, 168, 170-71, 249), confirming that these injuries continue to the present day. [TR at 316:22-320:12 (L. Phillips)]. Specifically, Mr. Phillips testified that (1) the current elevated phosphorus levels are in violation of the State's antidegradation water quality standards, [TR at 316:22-317:10, 318:17-319:3 (L. Phillips)]; (2) the current elevated phosphorus concentrations in the Illinois River, Flint Creek, and Barren Fork Creek exceed the total phosphorus criterion applicable to Scenic Rivers, and the aesthetics beneficial use is impaired for total phosphorus in violation of Oklahoma water quality standards, [TR at 317:11-25 (L. Phillips)]; (3) the current elevated phosphorus concentration levels have resulted in significant increases in the algal biomass in the rivers and streams of the IRW, impacting their aesthetics, [TR at 318:1-16 (L. Phillips)]; (4) the current elevated phosphorus concentration levels have caused excessive growth of periphyton, phytoplankton or aquatic

¹⁴ In assessing water quality conditions in Lake Tenkiller, the OWRB utilizes a 10-year sampling window. [TR at 193:17-194:8 (Chambers); OAC 785:46-15-3(c)(3)].

macrophyte communities, impairing the aesthetics, fish, and wildlife beneficial uses in violation of the State's water quality standards, [TR at 319:4-20 (L. Phillips)]; (5) the current elevated phosphorus levels have caused, and are causing, injury to the Illinois River and its tributaries, as well as the biota therein, [TR at 319:21-320:12 (L. Phillips)]; and (6) seven segments of the Illinois River and its tributaries have been listed on Oklahoma's 2022 303(d) list as impaired for phosphorus. [TR at 321:3-19, 322:15-324:10 (L. Phillips); OKLA_PX_0248_00241-43].

13. Mr. Edward Fite,¹⁵ water quality manager at the Grand River Dam Authority (GRDA), [TR at 12:5-14:25, 31:3-5 (Fite)], offered observational testimony that, since the 2009 trial, the waters of the IRW have not materially improved as to algae and clarity. [TR at 62:10-64:22, 75:19-77:7, 82:6-85:17 (Fite)]. In fact, Mr. Fite observed that, compared to the 2009 trial, algae growth in the rivers and streams is presently "more pronounced." [TR at 83:14-17 (Fite)].

2. Phosphorus-related injuries as to Lake Tenkiller

14. Ms. Chambers provided expert testimony regarding some of this Court's core findings from the 2009 trial regarding injuries to Lake Tenkiller (*e.g.*, Doc. 2979 at FOF Nos. 239-41, 243, 245, 248, 250), confirming that these phosphorus-related injuries continue to the present day. [TR at 202:7-206:7, 207:8-210:8 (Chambers)]. Specifically, Ms. Chambers testified that (1) the lake is still eutrophic due to these elevated phosphorus levels, [TR at 202:7-203:13 (Chambers)]; (2) the current elevated phosphorus levels continue to result in increased algae growth, decreased water clarity, and decreased dissolved oxygen levels in the lake, [TR at 203:14-206:7; OKLA_PX_0248_00241 (Chambers)]; (3) the decreases in water clarity in the lake are having an adverse impact on recreational activities and aesthetics, [TR at 207:8-23 (Chambers)];

¹⁵ Mr. Fite is responsible for the water quality of all GRDA jurisdictional waters, including Flint Creek and Barren Fork Creek. [TR at 12:5-20, 13:6-8 (Fite)]. Prior to 2016, Mr. Fite was employed by the Oklahoma Scenic Rivers Commission. [TR at 12:5-23, 13:9-19 (Fite)].

(4) the current elevated phosphorus concentrations have degraded water quality in the lake, and continue to impair its aesthetics, fish and wildlife, and public water supply beneficial uses in violation of Oklahoma water quality standards, [TR at 208:1-209:22 (Chambers)]; (5) the elevated phosphorus levels continue to cause injury to the lake, as well as the biota therein, [TR at 209:23-210:8 (Chambers)]; and (6) both segments of the lake have been listed on Oklahoma’s 2022 EPA-approved 303(d) list as being impaired for phosphorus.¹⁶ [TR at 199:8-202:2, 204:3-206:7 (Chambers); OKLA_PX_0248_00241].

15. Mr. Timothy Knight, the owner and operator of Nautical Adventures Scuba, testified that continuing water clarity and visibility issues in the waters of Lake Tenkiller have made dive training, dive certification, and recreational diving increasingly difficult. [TR at 163:1-22, 166:9-167:17, 168:6-169:19, 169:24-172:1 (Knight) (testifying there has been a “[c]ontinuous decline in visibility over the last 10, 15 years”)]. Mr. Knight also testified that the algae blooms in Lake Tenkiller have become “much heavier” and have lasted longer over the years, which affects the visibility for diving. [TR at 177:25-178:9 (Knight)].

16. Defendants’ witness, Mr. Rick Stubblefield, a long-time member and chair of the Oklahoma Scenic Rivers Commission, confirmed that the waters of Lake Tenkiller and the Illinois River are not crystal clear. [TR at 1088:6-1089:3, 1124:12-1125:21 (Stubblefield)].

3. Summary of findings

¹⁶ In all, nine water segments in the IRW have been listed as impaired for phosphorus on Oklahoma’s 303(d) list – seven Scenic River segments and two lake segments. None of these segments in the Oklahoma portion listed as impaired for phosphorus have been delisted. [TR at 410:11-21 (S. Phillips)]. Underscoring the reach of the phosphorus problem, the EPA, in approving the Arkansas’s 2020 303(d) list, itself added seven segments in the Arkansas portion of the IRW as violating Arkansas’ narrative criteria for nutrients. [TR at 410:22-411:1 (S. Phillips)].

17. The Court finds that the Illinois River and its tributaries in Oklahoma, as well as Lake Tenkiller, are still injured as a result of elevated phosphorus levels.

D. Nonpoint source phosphorus

18. Evidence adduced at the 2009 trial showed that nonpoint source phosphorus was a significant contributor to phosphorus loadings in the waters of the IRW. [*See* Doc. 2979 at FOF Nos. 259-74, 287, 377, 380, 493]. There does not appear to be any dispute that nonpoint sources continue to be a significant contributor of phosphorus to the Illinois River and its tributaries in Oklahoma, as well as to Lake Tenkiller. [*See, e.g.*, TR at 542:14-17 (S. Phillips) (agreeing nonpoint source pollution continues to be “a major part” of the pollution of the IRW); TR at 1192:24-1194:21 (McDonnell) (testifying he does not believe that phosphorus from poultry litter is no longer a major contributor to phosphorus levels in the IRW); *see also* TR at 831:17-832:1 (Connolly) (conceding he had done no further analysis on comparative loadings since the 2009 trial);¹⁷ OKLA_PX_0374 (table showing current phosphorus loading from wastewater treatment plants is roughly the same as it was at the 2009 trial)]. The Court thus reaffirms its finding that nonpoint source phosphorus is still a significant contributor to the phosphorus loadings to the Illinois River and its tributaries, as well as to Lake Tenkiller. [*See* Doc. 2979 at FOF No. 287].

19. This Court also previously found that nonpoint source phosphorus is a significant source of the phosphorus causing injury to the Illinois River and its tributaries and to Lake Tenkiller. [Doc. 2979 at FOF No. 288]. In apparent response, Defendants re-called retained expert Dr. Connolly, who offered largely the same opinion that he offered at the 2009 trial: that nonpoint

¹⁷ At the 2009 trial, Dr. Connolly did not dispute that 70 to 80 percent of the phosphorus moving into Lake Tenkiller came from nonpoint sources. [Doc. 2979 at FOF No. 274].

source phosphorus is not materially affecting water quality in the IRW. [*Compare* Doc. 2979 at FOF No. 274 *and* TR at 829:14-830:1, 880:4-12 (Connolly)].

20. This Court cannot credit Dr. Connolly's opinion. *First*, at no point did Dr. Connolly retract any of his testimony from the 2009 trial relied upon by this Court in making its finding that nonpoint source phosphorus is a significant source of the phosphorus causing injury to the waters of IRW. [*See, e.g.*, FOF Nos. 274-85].

21. *Second*, Dr. Connolly's current analysis is based on utilizing water sampling *only* from flows at which base flow is at least 55 percent of total flow. [*See, e.g.*, TR at 778:20-779:14, 801:5-803:7, 870:7-10, 875:12-16 (Connolly)]. However, as noted above, Oklahoma's water quality standards contain no such limiting criteria, [*see, e.g.*, TR at 870:7-872:4 (Connolly); TR at 310:20-25 (L. Phillips)], and thus his analysis is rendered unreliable.

22. *Third*, Dr. Connolly's opinion that high-flow events (at which time nonpoint source phosphorus loading would be higher) do not impact water quality hinges almost entirely on his interpretation of the 2016 Joint Study. [TR at 842:1-7, 780:24-781:5 (Connolly)]. Yet, Dr. Connolly conceded the 2016 Joint Study did not rule out the possibility that there can be algae growth following high-flow events. [TR at 859:25-868:15 (Connolly); *see also* TR at 873:8-22 (Connolly) (agreeing there is going to be "some" algal growth at higher flows)].

23. *Fourth*, Dr. Connolly's opinion is premised on a fundamental misunderstanding of the characteristics of the Illinois River and its tributaries, particularly during high flows.¹⁸ As Mr. Fite explained, during rain events leading to high flows, phosphorus will run off the landscape and into the rivers, and some of this phosphorus will be deposited in the Illinois River itself and some

¹⁸ In contrast to the State's witnesses who testified to regular observations of the waters of the IRW, Dr. Connolly has only been to the IRW for one day in 2008. [TR at 828:10-829:13 (Connolly)].

of it will be flushed into Lake Tenkiller. [TR at 81:18-82:5 (Fite); *see also* TR at 80:9-12 (Fite)]. Mr. Phillips similarly explained that during high flows the water of the Illinois River does not flow at a constant velocity; even at high flows the river still has a run-riffle-pool kind of morphology and areas where it slows down and things can deposit. [TR at 314:8-19 (L. Phillips)]. And even Dr. Connolly conceded there could be phosphorus in the river sediments that settled out during high-flow events. [TR at 837:8-15 (Connolly)]. Moreover, Dr. Connolly's opinion ignores that even at low flows, the waters of the IRW are fed by alluvial groundwater. [See TR at 77:16-78:24 (Fite) (confirming "rivers and streams in the IRW are fed primarily from alluvial groundwater" and "alluvium . . . is recharged by surface water in rivers and streams during high flow events")].

24. *Fifth*, charts used in Dr. Connolly's analysis reflect that some fraction of the phosphorus contained in the water sampling from flows at which base flow is at least 55 percent of total flow is from nonpoint sources.¹⁹ [TR at 875:17-877:9 (Connolly); DJX2-217C (Figures 5-17 & 5-19) (showing delta between total phosphorus loading and WWTP phosphorus loading)].

25. *Sixth*, Dr. Connolly's opinion that nonpoint source phosphorus does not materially impact water quality is inconsistent with his discussion of the significance of other changes in the IRW that target nonpoint source phosphorus pollution (*e.g.*, use of best management practices and implementation of nutrient management plans), as under his theory these nonpoint source pollution controls would seemingly be irrelevant to water quality. Nor can his opinion be reconciled with other defense witnesses – Dr. Dimitrios Vlassopoulos²⁰ (testifying about the effects of urbanization

¹⁹ Further calling into question the reliability of Dr. Connolly's analysis of the sources comprising the phosphorus loading is that on a number of occasions Dr. Connolly's charts depict loading from wastewater treatment plants to be greater than total loading in the river. [TR at 877:10-879:23 (Connolly) (confirming limitations in the data he used for his analysis introduced "uncertainty")].

²⁰ Dr. Vlassopoulos is a Principal Scientist at Anchor QEA, an environmental science and engineering consulting firm. [TR at 904:9-12 (Vlassopoulos); DJX2-0221-A].

on nonpoint source pollution), Dr. Todd McDonnell²¹ (testifying about the effects of best management practices on nonpoint source pollution), and Mr. Fisk (testifying about poultry litter hauling efforts) – as under his theory these witnesses’ testimony would likewise be irrelevant.

26. Finally, and perhaps most tellingly about the implausibility of Dr. Connolly’s theory is that, were it correct, the myriad Oklahoma, Arkansas, and federal programs in place to address nonpoint source phosphorus pollution (*e.g.*, nutrient management plans, waste hauling programs, 319 projects) would be unnecessary.

27. The Court reaffirms that nonpoint source phosphorus is still a significant source of the phosphorus causing injury to the waters of the IRW.

E. Question 3: Whether phosphorus from current and historic land-application of poultry litter in the IRW for which Defendants are responsible is *still* a substantial contributor to the elevated, injury-causing phosphorus levels in the waters of the IRW

1. Phosphorus from Defendants’ current poultry operations in the IRW

28. Since the 2009 trial, Defendants have continued to have significant poultry operations in the IRW. Ms. Lynette Jordan, the Assistant Director for Agricultural Environmental Management Services at the Oklahoma Department of Agriculture, Food, and Forestry (“ODAFF”) [TR at 661:9-662:1 (Jordan)], testified that ODAFF tracks poultry feeding operations (“PFOs”) in the Oklahoma portion of the IRW pursuant to the Oklahoma Registered Poultry Feeding Operations Act [TR at 662:14-24 (Jordan)]. These PFO records are maintained in ODAFF’s database, which allows ODAFF to track all PFOs in Oklahoma based on GPS coordinates and identify those that are within the IRW hydrologic unit code. [TR at 675:2-676:21,

²¹ Dr. McDonnell is a Principal Scientist at and the President of E&S Environmental Chemistry, an environmental assessment consulting firm. [TR at 1143:18-1144:3 (McDonnell); DJX2-219-A].

678:3-9 (Jordan)]. Based on these records, in the Oklahoma portion of the IRW at the time of the hearing, there were 94 PFOs, 419 poultry houses, and 8,741,500 bird capacity per flock. [TR at 692:14-693:17 (Jordan); OKLA_PX_0227].²² About five flocks cycle through a typical poultry house per year. [TR at 563:11-23 (S. Phillips); *accord* Doc. 2979 at FOF No. 312].

29. Of these 94 PFOs in the Oklahoma portion of the IRW, 69 (or 73.4%) were affiliated with Defendants. [TR at 692:14-693:3, 693:18-25 (Jordan); OKLA_PX_0227]. Specifically, 21 PFOs were affiliated with Tyson, 23 were affiliated with Simmons, 18 were affiliated with Cobb, 6 were affiliated with Cargill, and one was affiliated with George's.²³ [TR at 686:5-8, 688:22-689:5, 689:24-690:8, 690:19-21, 691:4-5 (Jordan); OKLA_PX_0227].

30. Of the 419 poultry houses in the Oklahoma portion of the IRW, 355 (84.7%) were affiliated with Defendants.²⁴ [TR at 694:4-10 (Jordan); OKLA_PX_0227]. Specifically, 175 houses were affiliated with Tyson, 110 houses were affiliated with Simmons, 49 houses were affiliated with Cobb, 18 houses were affiliated with Cargill, and 3 houses were affiliated with George's. [TR at 686:9-25, 689:6-14, 690:9-24, 692:6-8 (Jordan); OKLA_PX_0227].

²² In 2022, in connection with her work for the OCC, Ms. Phillips undertook to determine how many poultry houses and how many birds there were in the IRW, as well as how much poultry litter was being generated. [TR at 373:16-374:25 (S. Phillips)]. At that time, she had access to ODAFF information from 2018, but she had no access to any similar information for the Arkansas portion of the IRW. [TR at 375:7-377:4 (S. Phillips)]. Using Google Earth satellite imagery and GIS, Ms. Phillips sought to update the 2018 Oklahoma information. [TR at 378:4-15 (S. Phillips)]. From this work, Ms. Phillips estimated that in 2022 there were 436 active poultry houses in the Oklahoma portion of the IRW, [TR at 400:21-401:3 (S. Phillips)], and 53,027,040 birds in the Oklahoma portion of the IRW, [TR at 564:24-565:11 (S. Phillips)].

²³ Although the nutrient management plan submitted to ODAFF states that this George's-affiliated PFO is in the Eucha-Spavinaw Watershed, [OKLA_PX_104_00079], the GPS latitude-longitude coordinates confirm that this PFO is indeed in the IRW. [TR at 742:4-744:18 (Jordan)].

²⁴ For comparison purposes, from the 2009 trial the Court found that there were 425 poultry houses in the Oklahoma portion of the IRW. [Doc. 2979 at FOF No. 314].

31. Of the 8,741,500 bird-capacity per flock in the Oklahoma portion of the IRW, 7,931,200 (90.7%) were attributable to Defendants. [TR at 694:11-16 (Jordan); OKLA_PX_0227]. Specifically, 4,159,100 birds per flock were attributable to Tyson, 3,104,200 were attributable to Simmons, 381,300 were attributable to Cobb, 226,600 were attributable to Cargill, and 60,000 were attributable to George's. [TR at 687:1-16, 689:15-19, 690:14-18, 690:25-691:1, 692:9-11 (Jordan); OKLA_PX_0227].

32. Due to statutory privacy protections, data reflecting the number of PFOs, the number of poultry houses, and the bird-capacities per flock in the Arkansas portion of the IRW are not available to the State. [See Ark. Code § 15-20-904(f); TR at 1021:5-11, 1058:19-23, 1061:1-2, 1067:4-8, 1072:2-8 (Fisk²⁵) (testifying grower-specific information could not be provided under Arkansas law); *see also* TR at 1058:6-10 (Fisk) (confirming under Arkansas FOIA, non-citizens are not entitled to make public document requests)]. Nor are data reflecting the integrator-affiliations of these Arkansas PFOs publicly available. [See Ark. Code § 15-20-901 *et seq.*; TR at 1016:1-9 (Fisk)]. As such, Ms. Phillips utilized Google Earth satellite imagery and GIS to estimate the number of active poultry houses in the Arkansas portion of the IRW, as well as the bird capacity of those houses. [TR at 377:2-10, 391:15-392:5 (S. Phillips)]. From that work, Ms. Phillips estimated that in 2022 there were 1,363 active poultry houses in the Arkansas portion of the IRW,²⁶ [TR at 400:21-401:6 (S. Phillips)²⁷], with approximately 181,530,000 birds being raised annually.

²⁵ Mr. Patrick Fisk is director of the livestock and poultry division at the Arkansas Department of Agriculture. [TR at 983:10-11 (Fisk); DJX2_325].

²⁶ For comparison purposes, from the 2009 trial the Court found that there were 1,455 poultry houses in the Arkansas portion of the IRW. [Doc. 2979 at FOF No. 314].

²⁷ When this Arkansas figure is added to Ms. Phillip's Oklahoma figure (436), it yields a total of 1,799 houses in 2022. While Ms. Phillips later testified that the total was 1,811 houses, [TR at 561:21-23 (S. Phillips)], that number is not materially different from her earlier number. Moreover, Defendants offered no countervailing evidence on the number of poultry houses in the IRW.

[TR at 565:12-14 (S. Phillips); *see also* TR at 39:11-40:3, 41:4-8 (Fite) (testifying that since trial, poultry production activity on the Arkansas side of the IRW has remained the same or increased, with new, larger poultry houses being built)].²⁸ Also from her investigation, she estimated that roughly 25 percent of the active poultry houses in the IRW were located in Oklahoma, and roughly 75 percent were located in Arkansas.²⁹ [TR at 491:10-12 (S. Phillips)].

33. Although Defendants attempted to call the methodology underlying Ms. Phillips' estimates into question through cross-examination and through the testimony of Dr. Vlassopoulos,³⁰ the Court finds Ms. Phillips' methodology reliable and her estimates credible. [TR at 937:2-9, 971:15-975:8, 977:4-981:6 (Vlassopoulos) (asserting a more reliable method to determine the number of active poultry houses would have been to use registration data, but later admitting he was unaware of the data access challenges that led Ms. Phillips to do her estimates)]. Indeed, when Ms. Phillips compared her estimates of the number of poultry houses in the Oklahoma portion of the IRW with the 2024 ODAFF data, there was 98 percent agreement. [TR at 400:9-13 (S. Phillips)]. Moreover, the most effective way to have rebutted these estimates would have been to introduce the actual numbers of houses and birds in Arkansas affiliated with

²⁸ Ms. Phillips arrived at this estimate by assigning capacities by house size based upon a review of the literature and ODAFF records. [TR at 562:9-563:2 (S. Phillips)].

²⁹ Although due to limitations in the available data, the State was unable to show the precise number of Defendant-affiliated poultry feeding operations, poultry houses, and birds raised in the Arkansas portion of the IRW, all indications are that Defendants continue to maintain a significant operational presence there. For instance, were the Defendants to currently have no operational presence in the Arkansas portion of the IRW there would have been no need for Defendants to have called Mr. Fisk to testify at the hearing. Moreover, no Defendant offered any evidence that it had materially reduced its operations in the IRW since the 2009 trial, [*see* Doc. 2979 at FOF Nos. 290-94, 314], which presumably each would have done had this been the case.

³⁰ Dr. Vlassopoulos opined that the five criteria that Ms. Phillips used in her study – either alone or in combination – could not provide “unequivocal proof” that a poultry house was active or not. [TR at 934:3-12 (Vlassopoulos)]. Of course, the law does not require such an exacting standard.

Defendants – information in the possession of Defendants. But Defendants chose not to do so.³¹

34. Just as the Court concluded from the 2009 trial, the foregoing evidence confirms that Defendants (aside from Defendants Peterson and Cal-Maine) continue to “maintain[] significant poultry operations in the IRW.” [See Doc. 2979 at FOF No. 316].

35. Based upon ODAFF records, approximately 55,992 tons of poultry litter were generated in the Oklahoma portion of the IRW in 2023.³² [TR at 700:20-24 (Jordan)]. Similar data for the Arkansas portion of the IRW is not readily available, as the Arkansas Department of Agriculture publishes aggregated poultry litter production data by county rather than by watershed. [See, e.g., DJX2_0051, _0052, _0053, _0054, _0207, _0208, _0209, _0259A, & _0260A (reflecting county, not watershed data); TR at 1082:16-21 (Fisk)]. Roughly one-third of Benton County and one-half of Washington County are in the Arkansas portion of the IRW. [TR at 1025:9-14 (Fisk)]. Arkansas estimates that 379,652 tons of poultry litter were generated in 2023 in these two counties. [DJX2-0207]. In her calculation of poultry litter generation per year in the IRW as a whole, Ms. Phillips used a literature value of 22 grams of waste per day per bird, and multiplied that value (1) by the number of birds in the watershed annually and (2) by 45 (the number of days

³¹ Defendants stated they would bring witnesses who would offer “testimony regarding grower operations and practices of the individual Defendants.” [Doc. 3091 at 11]. But with the exception of the Cargill Defendants, Defendants did not call any of the corporate witnesses they listed – and the Cargill Defendants objected to questioning of their corporate witness about the Cargill Defendants’ poultry operations. [TR at 1142:24-1143:3 (Alsup)]. Moreover, Defendants’ retained experts made no inquiry into Defendants’ poultry operations. [TR at 977:4-25 (Vlassopoulos) (testifying he did not “ask the defendants” for information about their poultry operations); TR at 1198:12-15 (McDonnell) (testifying he did not “inquire of any of the integrators” as to their current operations); TR at 855:13-25 (Connolly) (testifying inquiry into poultry litter “was outside the scope of the work that I undertook”); see also TR at 1079:24-1080:14 (Fisk) (testifying he has information about Defendants’ poultry operations in Arkansas, but was not asked to bring it)].

³² ODAFF records do not take stored poultry litter into account in calculating the amount of poultry litter generated. But, as Ms. Jordan explained, taking into account stored poultry litter would simply increase the amount-generated figure. [TR at 740:20-741:2 (Jordan)].

a flock would be housed).³³ [TR at 566:3-6 (S. Phillips)]. Ms. Phillips arrived at an estimate of 255,120 tons of poultry litter being generated per year in the IRW.³⁴ [See TR at 566:2-15 (S. Phillips)]. Ms. Phillips' estimate is thus in the same range as the data from ODAFF and the Arkansas government estimates (when those Arkansas government estimates are geographically prorated).

36. The ultimate disposition of the poultry litter generated in the IRW is difficult to pin down. [TR at 667:8-668:25, 700:25-701:3 (Jordan) (testifying that once poultry litter leaves a PFO "it's difficult to tell exactly where it may have gone"); TR at 1024:9-12 (Fisk) (testifying that "transferred" poultry litter does not necessarily mean that the poultry litter is being applied outside the watershed); TR at 40:22-24, 102:16-22 (Fite) (testifying that Defendants have not been forthcoming with him on where their poultry litter goes); TR at 373:16-374:22 (S. Phillips) (testifying that publicly-available data regarding poultry litter "didn't make sense")].³⁵ That said,

³³ Per the literature, a broiler produces 22 g/day of waste, a pullet produces 27 g/day, a layer produces 40 g/day, and a turkey produces 57 g/day. [TR at 589:22-591:16 (S. Phillips)].

³⁴ For comparison purposes, in the 2009 trial the State estimated that 354,000 tons of poultry litter were generated annually in IRW – a figure that Defendants did not seriously challenge. [Doc. 2979 at FOF No. 334]. Despite continued high levels of poultry operations in the IRW, one explanation for the current lower total tonnage figure may be the increased use of windrowing poultry litter. Windrowing is a process whereby in between flocks the poultry litter in the poultry house is pushed into two rows down the length of the house where it essentially "composts in place." [TR at 55:3-17 (Fite); TR at 401:24-402:5 (S. Phillips); TR at 1005:9-16 (Fisk)]. Through the windrowing process, the poultry litter dries out and loses total mass, and the ammonia and nitrogen concentration is reduced – although importantly no phosphorus is lost in the windrowing process. [TR at 402:1-13 (S. Phillips); TR at 1037:6-8, 1042:25-1043:16, 1044:11-19, 1082:6-15 (Fisk); TR at 1206:14-16, 1215:4-8 (McDonnell)]. Though Defendants' retained expert Dr. McDonnell posited that the use of phytase in broiler feed should affect the amount of phosphorus transferred from broilers to their bedding, [TR at 1160:22-1161:21 (McDonnell)], he did not undertake to quantify – and cannot quantify – the impact of any phytase use since the 2009 trial, or the extent to which Defendants use phytase. [TR at 1163:4-7, 1209:19-1210:6, 1210:10-1212:5 (McDonnell)]. Nor did Defendants introduce any evidence of their own use of phytase.

³⁵ Terminology used by ODAFF and the Arkansas Department of Agriculture regarding the disposition of poultry litter can be confusing. For instance, the terms "exported" and "transferred"

multiple lines of evidence support the proposition that significant quantities of poultry litter are still being land applied in the IRW.

37. ODAFF records indicate that of the approximately 55,992 tons of poultry litter that were generated in the Oklahoma portion of the IRW in 2023, 6,211 tons of that poultry litter were land applied on the generating PFO's own land, and 49,781 tons of that poultry litter were "exported" off the PFOs' properties – but not necessarily out of the IRW. [TR at 697:12-698:8, 699:2-11, 700:20-701:3 (Jordan); OKLA_PX_0230]. Indeed, ODAFF records for the same year show at least 60 litter "exports" to a recipient with an IRW address. [OKLA_PX_0230].

38. Arkansas Department of Agriculture records indicate that 315,965 tons of poultry litter were generated in Benton and Washington counties in 2018, with 36,392 tons being stored, 24,801 tons being applied on the generating PFO, and 227,290 tons being transferred. [DJX2-0212]. Of these approximately 227,290 tons of poultry litter that were transferred off of a generating PFO in Benton and Washington counties in 2018, 106,447 tons (or 46.83 percent) were shipped out of the IRW. [DJX2-0212B; TR at 1035:17-1036:12, 1047:11-17 (Fisk)].

39. Ms. Phillips estimated that roughly half of the poultry litter being generated in the IRW is land applied each year in the IRW: 127,560 tons. [TR at 539:23-24, 565:24-566:15 (S. Phillips)]. She further testified that growers affiliated with Defendants are still land applying poultry litter in the IRW. [TR at 538:9-12 (S. Phillips), *see also* TR at 542:18-21 (S. Phillips)].

40. Mr. Fite has personally observed the continued land application of poultry litter in the IRW. [TR at 42:18-43:10 (Fite)].

merely mean leaving the PFO's property and do not necessarily mean leaving the watershed. [*See, e.g.,* TR at 700:16-18 (Jordan); TR at 1012:7-10 (Fisk); TR at 374:5-10 (S. Phillips)].

41. Further, there are multiple indicators supporting the proposition that much of the poultry litter being generated in the IRW is remaining in the IRW: the amount of resources and trucking activity needed to haul all the litter out of the IRW, the lack of interest in litter-hauling incentive programs, and growers' own reports of their land applications. [TR at 405:1-407:12, 408:23-410:10 (S. Phillips); TR at 663:19-664:9 (Jordan); OKLA_PX_0230].

42. This Court thus finds that a significant amount of poultry litter – some portion of which Defendants are responsible for – continues to be land applied in the IRW.

43. There is no material disagreement that the fate and transport processes by which phosphorus from land-applied poultry litter gets into the waters of the IRW have remained consistent since the 2009 trial. Therefore, the Court need not revisit its findings on those issues. [TR at 415:25-416:3, 418:2-3 (S. Phillips) (testifying that land application still contributes significantly to phosphorus loading, which is dominated by nonpoint sources); TR at 411:2-415:13 (S. Phillips) (using OCC's small streams study to show that there is greater phosphorus loss from pasture lands where poultry litter may be applied, as compared to forested lands where poultry litter cannot be applied); TR at 604:24-605:19, 653:9-654:9 (Scott) (confirming that the "cherty geology" of the IRW creates "a higher than expected permeability" for phosphorus transfer); OKLA_PX_360]. Findings of Fact Nos. 3, 5, 399-402, and 416 are thus reaffirmed. [See Doc. 2979 at FOF Nos. 3, 5, 399-402, 416]. Similarly, there was no evidence adduced at the hearing that phosphorus in the poultry litter that is currently being land applied in the IRW behaves differently in the environment than it did in 2009 (and before), and hence that it no longer gets into the waters of the IRW. [TR at 612:14-21, 615:3-5 (Scott); TR at 541:12-542:21 (S. Phillips); TR at 854:19- 855:12 (Connolly) (testifying that he did no analysis of the relative contributions of poultry litter and other sources of phosphorus in the IRW); TR at 1216:23-1217:5 (McDonnell)

(testifying that he did no analysis of changes in litter management practices relative to the amount of phosphorus entering the IRW)].

44. And there is no credible evidence rebutting the fact that phosphorus is still causing injury. For instance, Ms. Phillips testified that it is still true today that land-applied poultry litter is contributing to the phosphorus loading of the waters of the IRW and adversely affecting water quality. [TR at 415:15-24 (S. Phillips)]. Indeed, as discussed above, Defendants’ sole response hinges on Dr. Connolly’s renewed opinion that nonpoint source phosphorus simply has no environmental effects on the waters of the IRW – an opinion that the Court did not and cannot credit based upon the 2009 trial and 2024 hearing evidence.

45. Defendants have suggested that changes in the IRW – namely the increased use of nutrient management plans and best management practices – have positively impacted nonpoint source phosphorus contributions to the waters of the IRW. However, Defendants’ witnesses presented no quantitative data to substantiate this suggestion. [TR at 853:15-19 (Connolly) (admitting he did no quantitative analysis as to the impacts of best management practices since 2008 on phosphorus pollution in the IRW); TR at 856:10-15 (Connolly) (“I did no analysis of the effectiveness of riparian buffers on loading to the river.”); TR at 857:20-24 (Connolly) (conceding he did no quantitative analysis as to whether nutrient management practices had any impact on phosphorus pollution in the IRW over the past 15 years); TR at 1163:4-7 (McDonnell) (conceding he did no quantitative assessment as to how best management practices have affected poultry litter’s phosphorus contribution to the waters of the IRW); *see also* TR at 1193:23-1194:3 (McDonnell) (admitting he did not “conduct a scientific analysis”)]. In fact, Ms. Phillips testified she does not believe there is any evidence that the implementation of nutrient management plans has led to reductions in phosphorus as those plans result in the application of phosphorus above

agronomic need.³⁶ [TR at 533:12-534:5 (S. Phillips); *see also* TR at 1045:1-11 (Fisk) (testifying Arkansas’s nutrient management scheme allows phosphorus application above the agronomic rate, and “in most cases” where poultry litter is applied the fields already have sufficient phosphorus)].

46. Similarly, Defendants have suggested that increased population and urban growth have adversely impacted phosphorus contributions to the waters of the IRW. However, again, Defendants’ experts did no analysis to quantify and substantiate this suggestion. [TR at 852:14-19 (Connolly) (admitting that he did no quantitative analysis as to the effects of urbanization since 2008 on phosphorus pollution in the IRW); TR at 1222:2-6 (McDonnell) (conceding that he did no quantitative analysis as to urban development’s contribution of phosphorus to the waters of the IRW); TR at 960:17-22 (Vlassopoulos) (acknowledging that he did not attempt to determine the effect of urban growth on water quality in the IRW)]. Furthermore, as noted previously, phosphorus loading from wastewater treatment plants has remained similar since the 2009 trial, despite the 24 percent increase in population in the IRW. [TR at 850:19-852:6 (Connolly); OKLA_PX_374; *see also* TR at 970:8-12 (Vlassopoulos) (conceding that he cannot say that the increased population has caused increased phosphorus loading in the IRW from WWTPs)].

47. Thus, just as it found based on the 2009 trial record, [*see* Doc. 2979 at FOF Nos. 535, 543, 585-86], the Court now finds based on the 2024 hearing record that “some fraction” of phosphorus from poultry litter generated by Defendants’ birds that continues to be applied in the IRW gets into the waters of the IRW, and that this phosphorus continues to be a “significant source” and “principal contributor” of the phosphorus causing injury to those waters.

³⁶ There have been no material changes to Oklahoma or Arkansas law regarding land application rates for poultry litter since 2010. [*See, e.g.*, TR at 432:18-435:24 (S. Phillips); TR at 1039:17-21 (Fisk); Doc. 2979 at FOF Nos. 101-05 (finding that “[a] phosphorus index thus allows land application of poultry waste in excess of the agronomic critical level and contributes to the elevation of STPs in areas where it is used”)].

2. Legacy phosphorus³⁷ from Defendants' historic poultry operations in the IRW

48. Phosphorus from the historic land-application of poultry litter in the IRW is also a substantial contributor to the current elevated phosphorus levels in the waters of the IRW in Oklahoma. Mr. Gregory Scott,³⁸ a non-retained expert for the State, testified that in the chert geology of the Ozark uplift in the IRW, phosphorus in the soil will be transported both horizontally (as run-off) and vertically (down to preferential groundwater flow paths) during rainfall events, ultimately getting into the streams and rivers of the IRW. [TR at 604:24-608:15 (Scott)]. This transport of legacy phosphorus from the soils where poultry litter has been land applied will continue until equilibrium is achieved in that soil. [TR at 627:2-19 (Scott)]. Thus, when poultry litter is land applied at a level of up to 300 STP, it will take approximately 30 years with haying and removal of that hay for the soil to reach equilibrium (and even longer if land application continues). [TR at 611:13-612:13, 626:24-627:8, 630:14-25, 631:16-22, 631:25-632:14 (Scott) (agreeing that the legacy phosphorus problem will take many years to work itself out)].

49. Mr. Scott's opinions are consistent with those of Defendants' expert Dr. Brian Haggard, who testified in 2009 that even years after the cessation of poultry litter application, runoff water quality can be affected by phosphorus stored in the soil. [See Doc. 2979, FOF No. 375]. And these opinions are consistent with this Court's previous findings regarding the long-term impacts of legacy phosphorus. [See, e.g., *id.* at FOF Nos. 81, 362, 365-70, 375, 531-32, 535, 542-43; COL Nos. 49, 61].

³⁷ "Legacy phosphorus" is that phosphorus in the soil above the natural content or agronomic need. (TR at 418:17-23 (S. Phillips); TR at 625:14-22 (Scott)). Legacy phosphorus is susceptible to leaching from the soil during runoff events. [TR at 419:14-21 (S. Phillips)].

³⁸ Mr. Scott worked for the NRCS from 1976 to 2013, and at the conclusion of his career there he served as the state soil scientist for Oklahoma. [TR at 594:6-13 (Scott)]. He now works for the OCC as a soil scientist and geomorphologist. [TR at 593:22-25, 595:6-10 (Scott)].

50. Defendants called no witnesses to rebut the proposition that legacy phosphorus is affecting, and will continue to affect, water quality in the IRW. [*See, e.g.*, TR at 1196:2-1197:6, 1219:14-17 (McDonnell) (testifying that he made no investigation into the role that legacy phosphorus plays in the pollution of the waters of the IRW and has no basis to question the Court's prior findings on legacy phosphorus)].

51. Each Defendant – including Defendants Cal-Maine and Peterson – has had poultry operations in the IRW where poultry litter was generated and land-applied in the IRW, [*see* Doc. 2979 at FOF Nos. 290-95, 334-38, 344, 361-63] – and therefore each is responsible for the ongoing environmental effects of legacy phosphorus.

3. Summary of findings

52. Phosphorus from current and historic land-application of poultry litter in the IRW for which Defendants are responsible is still a substantial contributor to the elevated, injury-causing phosphorus levels present in the waters of the IRW.

II. Conclusions of Law

1. The evidence presented at the hearing confirms the continued vitality of the Court's January 18, 2023 Findings of Fact and Conclusions of Law [Doc. 2979]. The Court accordingly reaffirms those findings and conclusions.

2. Specifically, the record developed at the hearing confirms that phosphorus from both the current and historic land application of poultry litter – poultry litter for which Defendants are legally liable [*see, e.g.*, Doc. 2979 at COL Nos. 11, 43-44, 51, 60-62] – continues to injure the

waters of the IRW and that the State remains entitled to relief on its claims, including the entry of an injunction and the imposition of statutory penalties against Defendants.

3. Thus, the Court finds and concludes that the conditions in the IRW have not materially changed, that the record in this case is not “stale,” and that this case is not prudentially moot.

4. The 2024 amendments to the Oklahoma Registered Poultry Feeding Operations Act [2 Okla. Stat. §§ 10-9.1 to 10-9.12] do not supplant the State’s causes of action. [*See* Okla. Const., Art. V, §§ 52 & 54; *State ex rel. Harris v. Three Hundred & Twenty Five Thousand & Eighty Dollars*, 2021 OK 16, ¶ 15, 485 P.3d 242, 246; TR at 141:23-25 (Defendants’ counsel agreeing)].

5. A hearing to address and determine the precise contours of the relief to which the State is entitled will be scheduled by separate order.

Respectfully Submitted,

s/ Gentner Drummond

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CERTIFICATE OF SERVICE

I hereby certify that on this 30th day of January 2025, I electronically transmitted the foregoing document to the Clerk of Court using the ECF System for filing and transmittal of a Notice of Electronic Filing to the ECF registrants with entries of appearance filed of record.

s/ Gentner Drummond

Gentner Drummond